IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF OREGON

PORTLAND DIVISION

FEREYDUN TABAIAN and AHMAD ASHRAFZADEH,

Plaintiffs,

v.

INTEL CORPORATION,

Defendant.

No. 3:18-cv-00326-HZ

OPINION & ORDER

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HERNANDEZ, District Judge:

Plaintiffs Fereydun Tabaian and Ahmad Ashrafzadeh are the inventors and owners of United States Patent No. 7,027,944 Patent ("the '944 Patent") which is titled "Programmable Calibration Circuit for Power Supply Current Sensing and Droop Loss Compensation," and which issued on April 11, 2006. Compl. ¶¶ 1, 7, 8, ECF 1, ECF 1-1. In this action, Plaintiffs allege that Defendant infringes the '944 Patent.

According to the September 7, 2018 amended case schedule, ECF 83, the parties filed claim construction briefs in April and May 2019. The briefing revealed that the parties agreed on two terms but disputed the meaning of eight other terms. I conducted a tutorial on June 19, 2019, and heard oral argument on June 20, 2019. This Opinion & Order resolves the eight claim construction disputes.

PATENT & DISPUTED CLAIMS INTRODUCTION

The patent discloses a "circuit for regulating power." '944 Patent, Abstract at 1, ECF 1-1. The full abstract recites:

> A circuit for regulating power is disclosed. The present invention provides circuits and methods for current sensing variations, static droop settings, mismatched phase outputs, and temperature variations in a multiphase power regulator. The circuits may include a calibration controller that senses and regulates both a current sensing circuit and the droop in a power regulator over a range of temperatures thus equalizing phase outputs. The present invention includes the schematic organization and implementation of the circuit, the circuit's calibration, its use, and implementation. This invention advantageously provides

> circuits and methods to properly power a processor or IC chip according to the unique power specifications of the processor or chip.

Id.

Claim 1 of the '944 Patent, the only independent claim, contains all of the disputed terms. With the disputed terms/phrases italicized, it recites:

> **1**. A circuit comprising: a regulator circuit and a *calibration control circuit*, wherein said *calibration control circuit* includes a controller, an interface with nonvolatile memory, *droop outputs*, *sense outputs*, *load voltage input*, and temperature input; wherein
>
>> said nonvolatile memory stores *calibration data*;
>>
>> said *calibration control circuit interfaces with said regulator circuit via said sense outputs, said droop outputs, and said load voltage input*;
>>
>> said *calibration control circuit interfaces with said non-volatile memory to store calibration data*;
>>
>> said *calibration control circuit* interfaces with said temperature input to receive temperature data;
>>
>> said *temperature data is used by said calibration control circuit to adjust said sense outputs and said droop outputs*; and
>>
>> said *calibration control circuit* interfaces with said temperature input and said load voltage input to calibrate said *calibration data* stored in said nonvolatile memory.

'944 Patent, 10:2-20 (emphases added)[1].

In addition to these disputed terms, the parties have agreed on the meaning of two additional terms appearing in Claim 1: (1) "nonvolatile memory": "memory that does not lose data when power to the memory is removed"; and (2) "temperature input": "input to the

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[1] All citations to the '944 Patent, with appropriate column and line numbers, are to ECF 1-1.

calibration control circuit that provides temperature data." Jt. Claims Const. Chart, Ex. A, ECF 115-1.

CLAIM CONSTRUCTION STANDARDS

Patent infringement analysis involves two steps. *Duncan Parking Techs., Inc. v. IPS Grp., Inc.*, 914 F.3d 1347, 1360 (Fed. Cir. 2019). First, the court construes the asserted patent claims. *Id.* (citing *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995) (*en banc*)). Second, the factfinder determines whether the accused product or method infringes the asserted claim as construed. *Id.* (citing *Markman*, 52 F.3d at 976). The first step, claim construction, is a matter of law "exclusively within the province of the court." *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996). "It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (*en banc*) (internal quotation marks omitted). Patent claims must precisely define the relevant invention to put both the public and competitors on notice of the claimed invention. *Id.*

To construe a patent claim, courts first look to the language of the claims in the patent itself, the description in the patent's specification, and the patent's prosecution history, all of which constitute a record "on which the public is entitled to rely." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996); *Dow Chem. Co. v. Sumitomo Chem. Co.*, 257 F.3d 1364, 1372 (Fed. Cir. 2001). The court considers other extrinsic evidence only if this intrinsic evidence is insufficient to resolve the ambiguity of a term. *Vitronics*, 90 F.3d at 1583.

"The actual words of the claim are the controlling focus." *Digital Biometrics, Inc. v.*

Identix, Inc., 149 F.3d 1335, 1344 (Fed. Cir. 1998). "[T]he words of the claims are generally given their ordinary and customary meaning." *Phillips*, 415 F.3d at 1312 (internal quotation marks omitted). "[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Id.* at 1313. There is a "heavy presumption" that a claim term carries its ordinary and customary meaning, and a party seeking to convince a court that a term has some other meaning "must, at the very least," point to statements in the written description that "affect the patent's scope." *Johnson Worldwide Assocs., Inc. v. Zebco Corp.*, 175 F.3d 985, 989 (Fed. Cir. 1999) (internal quotation marks omitted). This may be accomplished when: (1) "a different meaning [is] clearly and deliberately set forth in the intrinsic materials" of the patent; or (2) the use of "the ordinary and accustomed meaning of a disputed term would deprive the claim of clarity[.]" *K–2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999). In making this assessment, the court should use common sense and "the understanding of those of ordinary skill in the art" of the patent at issue, unless the patent history supplies another meaning. *Id.* at 1365.

Beyond the plain language of the claims, the patent specification is always highly relevant and often dispositive to the proper construction. *Vitronics*, 90 F.3d at 1582 (explaining that the specification is "the single best guide to the meaning of a disputed term"). The purpose of the patent specification is to teach and enable those skilled in the art to make and use the invention, along with the best method for doing so. *Cyber Acoustics, LLC v. Belkin Int'l., Inc.*, No. 3:13–cv–01144–SI, 2014 WL 1225198, at *2 (D. Or. Mar. 24, 2014) (citing *Phillips*, 415 F.3d at 1323). The inventor can use the specification to describe the invention in a number of ways, such

as describing different "embodiments" of the invention and by assigning particular meanings to specific claim language. *Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1360 (Fed. Cir. 2004); *Phillips*, 415 F.3d at 1316. The embodiments serve as illustrative examples of the invention claimed. *Phillips*, 415 F.3d at 1323 ("One of the best ways to teach a person of ordinary skill in the art how to make and use the invention is to provide an example of how to practice the invention in a particular case."). The inventor can also clarify that he or she intends the claim language to carry a specific meaning different from its ordinary one. *Id.* In these cases, "the inventor's lexicography governs." *Id.* at 1316.

Finally, the prosecution history, which contains the record of the proceedings before the Patent and Trademark Office (PTO), *Vitronics*, 90 F.3d. at 1582–83, may be useful where it "provides evidence of how the PTO and the inventor understood the patent." *Phillips,* 415 F.3d at 1317. However, this evidence is less valuable because it represents an "ongoing negotiation" between the inventor and the PTO. *Id.* The final result of that negotiation, the patent itself, provides better evidence of the claim's intended meanings at the time the patent issued. *Id.*

In the end, the "court's ultimate goal is to construe the disputed terms in a manner consistent with the way the inventor defined them and a person of ordinary skill in the art would understand them." *j2 Global Commc'ns Inc. v. Captaris Inc.*, No. CV 09–04150 DDP (AJWx), 2011 WL 837923, at *3 (C.D. Cal. Mar. 4, 2011). "The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Phillips*, 415 F.3d at 1316 (internal quotation marks omitted).

DISCUSSION

The disputed claim terms and phrases are: (1) "droop outputs"; (2) "sense outputs"; (3)

"calibration data"; (4) "calibration control circuit"; (5) "load voltage input"; (6) "temperature data is used by said calibration control circuit to adjust said sense outputs and said droop outputs"; (7) "said calibration control circuit interfaces with said nonvolatile memory to store calibration data"; and (8) "said calibration control circuit interfaces with said regulator circuit via said sense outputs, said droop outputs, and said load voltage input."

I. "Droop Outputs"

The first disputed term is "droop outputs" as recited in Claim 1's introductory paragraph and again in Elements 2 and 5. Plaintiffs' proposed construction is "outputs of the calibration control circuit used to adjust *voltage in circuitry, in a system that includes a droop function that can lower output voltage based on output current*." Defendant's proposed construction is "outputs of the calibration control circuit used to adjust *the droop function (i.e. the function that automatically lowers the output voltage based on the output current).*"

The italicized portions are disputed. The gist of the dispute is that Plaintiffs' proposal does not limit "droop outputs" to adjusting droop function. Plaintiffs offer a broader definition by expanding "droop outputs" to adjusting voltage generally in a system that includes a droop function. Defendant's proposal confines the adjustment made by the droop output to the droop function. I agree with Defendant because its proposed construction is supported by the claim language and the specification, and is consistent with the patent's purpose.

The introductory paragraph of Claim 1 discloses a regulator circuit and a calibration control circuit (CCC). '944 Patent, 10:2-3. But, after this introductory language, Claim 1 contains only one additional reference to the regulator circuit. That reference is in Element 2 where the claim discloses that the CCC "interfaces with said regulator circuit via said sense

outputs, said droop outputs, and said load voltage input." *Id.*, 10:8-10. Although this element refers to the regulator circuit, the focus is on the action of the CCC. Thus, Claim 1 addresses the components and function of the CCC.

The first of the three references to "droop outputs" in Claim 1 is in the introductory paragraph which lists the components of the CCC. *Id.*; 10:5. The second is in Element 2 as noted in the previous paragraph where the claim recites that the CCC interfaces with the regulator circuit via droop outputs. *Id.*; 10:8-10. The third is in Element 5 which provides that the CCC uses temperature data to adjust the sense and droop outputs. *Id.*; 10:15-17. Claim 1's plain language recites (1) a circuit that includes a CCC which has droop outputs as one of several components; (2) the CCC uses temperature data to adjust the droop outputs; and (3) the CCC then uses the droop outputs to interface with the regulator circuit.

Plaintiffs note the absence of the phrase "droop function" in Claim 1. According to Plaintiffs, such absence shows "droop outputs" is not limited to "droop function." They also argue that because their proposal refers to "droop function" within a larger system environment, they do not read "droop" out of the term "droop output." Defendant argues that Plaintiffs read "droop" out of "droop outputs" because Plaintiffs' construction allows the droop outputs to adjust voltage generally. Notwithstanding that Plaintiffs' proposal includes the presence of a system including a droop function, the crux of Plaintiffs' proposed interpretation is that droop outputs may adjust voltage generally.

The claim language indicates that "droop outputs" relate to "droop" in some fashion. The language of Claim 1 shows that the CCC uses temperature data to adjust the droop outputs which then interface with the regulator circuit. By distinguishing "droop output" from "sense output,"

and by not using a more generic term of "output," Claim 1 indicates that a "droop output" is related to "droop."

Plaintiffs also point to the absence of an "error circuit," a "droop amplifier, or "current sense circuit" in Claim 1. These components are part of the circuitry shown in Figure 1. Because the plain language of Claim 1 omits these terms, Plaintiffs argue that "droop output" is not limited to droop function or to what is shown in Figure 1.

Plaintiffs are correct that Claim 1 does not recite an error circuit, a droop amplifier, or a current sense circuit. But, it does recite that the CCC interfaces with the regulator circuit via the droop outputs which the CCC adjusts based on temperature data. Claim 1 discloses the components of the CCC. The parties, however, dispute what these components ultimately do. In order to resolve the dispute over the meaning attributable to a component such as "droop outputs," I must determine the function of the component as disclosed in the patent. That function is gleaned from the other parts of the patent including the specification, the claims, and the purpose. Thus, while the words of Claim 1 do not themselves refer to the error circuit, the droop amplifier, or the current sense circuit, Claim 1 makes clear that the CCC uses the droop outputs to provide information relevant to droop to the regulator circuit. Because, as explained below, the regulator circuit includes circuits in which droop outputs relate to droop function, Defendant's proposed construction finds more support in the plain language of Claim 1 than Plaintiffs' proposal.

The specification explains that the CCC may use the droop outputs to adjust the droop amplifier. *Id.*, 7:23-25. The droop amplifier "drives the error circuit." *Id.*, 7:17-18; *see also id.*, 8:64-67 ("This adjustable droop amplifier **180** may be used to adjust the droop loss across the

current sense circuit **140**. The adjustment of the droop amplifier **180** may be used to drive an error circuit."). Droop function "is used in a power supply to automatically lower the output voltage based on the output current." *Id.*, 1:36-38. Plaintiffs themselves acknowledge that "the function of automatically lowering the output voltage based on the output current is implemented by the adjustable droop amplifier 180 in conjunction with [the] error circuit." Pls.' Op. Brief 7-8, ECF 143 (citing '944 Patent, 9:7-9). These specification descriptions support Defendant's contention that the droop outputs adjust the droop amplifier which in turn drives the error circuit to implement the droop function and therefore, the droop outputs are outputs of the CCC that adjust the droop function.

Figure 1 of the '944 Patent "is a schematic of one embodiment of the present invention showing two phases of a multiphase regulator connected with a calibration control circuit **190**[.]" '944 Patent, 8:34-36. Figure 1 reveals the various connections between the CCC and the regulator circuit. Figure 1 clearly shows the CCC providing input to the adjustable droop amplifier **180**. It also clearly shows that the adjustable droop amplifier provides input to the error circuit **170** which provides input to the error amplifier **175**. The error amplifier provides input to the pulse width modulator (PWM) **160**. *Id.*, Fig 1; *see also id.*, 9:7-9 ("The output of the error amplifier **175** drives one port of each pulse width modulator **160** to compensate for the droop loss."). The PWM then adjusts the output power. *E.g.*, *id.*, 8:59-9-11.

Figure 2 is a more detailed schematic of the CCC. *Id.*, 9:23-24 (stating that the CCC in Figure 1 is shown in more detail in Figure 2); *see also id.*, 9:24-25 (Figure 2 "shows one embodiment of the calibration control circuit"). There, the CCC is shown to have several components, including the controller, the nonvolatile memory, and digital to analog and analog

to digital converters. *Id.*, Fig. 2. Figure 2 shows that the CCC "controls the adjustments to the droop amplifier via the droop output **550**[.]" *Id.*, 9:25-27. The "droop output **550** from the controller **500** in one embodiment interfaces with the adjustable droop amplifier via digital to analog converter with registered input **600** and amplifier **640**." *Id.*, 9:37-40.

Figures 1 and 2 show that the CCC uses the droop outputs to control adjustments to the droop amplifier. Together, the specification and the figures show that the droop amplifier, via the error circuit and then the PWM, adjusts the droop function which is the function that automatically lowers the output voltage based on the output current.

While Plaintiffs acknowledge that the CCC uses the droop outputs to make adjustments in a system that includes a droop function which lowers output voltage based on output current, they contend that the claim term is not limited to adjustments to the droop function. Instead, Plaintiffs argue that "droop outputs" is properly interpreted to allow adjustments to voltage more generally in a system with a droop function. In support, they rely heavily on the following sentence which appears in the specification's description of Figure 1: "Adjusting the droop amplifier **180** may be equivalent to adjusting the reference voltage." *Id.*; 9:4-5. Plaintiffs argue that this shows that the CCC uses droop outputs to adjust voltage generally in the regulatory circuitry. They contend that this description confirms that droop outputs adjust voltage without necessarily adjusting droop function. They assert that the phrase is a clear statement that "droop output(s) may adjust an output voltage[.]" Pls.' Resp. Br. 14, ECF 150.

I disagree. Plaintiffs' interpretation of this single sentence is taken out of context. When the specification's full description of Figure 1 is considered, it is clear that the specification explains that adjusting the droop amplifier causes the PWM, via the error circuit, to set the

voltage at a different level and therefore, adjusting the droop amplifier to implement a droop function effectively changes the level of voltage targeted by the regulator. The entire passage is as follows:

> The output of the adjustable sense amplifier **150** drives the current sense input of the pulse width modulator (PWM) **160** to generate the proper pulse width signal to the power output FET **130** to regulate the output power. The adjustable sense amplifier **150** also drives the shared summing input port to the adjustable droop amplifier **180**. *This adjustable droop amplifier **180** may be used to adjust the droop loss across the current sense circuit **140**. The adjustment of the droop amplifier **180** may be used to drive an error circuit.* The adjusted voltage driver circuit may be compared against the reference voltage at the error amplifier **175** to generate the error voltage value for the pulse width modulators **160**. *Adjusting the droop amplifier **180** may be equivalent to adjusting the reference voltage.* The load voltage **165** may be monitored via the calibration control circuit **190**.
>
> The output of the error amplifier **175** drives one port of each pulse width modulator **160** to compensate for the droop loss. The output of an individual pulse width modulator **160** drives its associated phase control set register **110** to control the output drive FET **130**.

'944 Patent, 8:59-9:11 (emphases added). The surrounding language supports Defendant's construction which effectively places the word "thus" at the beginning of the sentence at line 4 of column 9 so that it reads: "[Thus,] [a]djusting the droop amplifier **180** may be equivalent to adjusting the reference voltage." The only sensible conclusion from reading the sentence in context is that the sentence is a continuation of the preceding description and expresses the concept of "in this or that manner or way," meaning that adjusting the droop amplifier in the manner or way just described in the preceding passage results in an adjustment to the reference voltage. Because the "in this manner or way" includes driving the error circuit which inputs to the PWM to adjust the voltage, the sentence does not recite that the droop outputs are used to adjust voltage generally in the regulator circuitry.

The background and purpose of the invention also support Defendant's construction. The '944 Patent states that a problem with multiphase voltage regulators is the mismatch in the current between phases. *Id.*, 1:19-23 ("the load current is not always equally shared among all the phases of multi-phase regulators causing inadequate operation and excessive heat in the power devices of one or more phases of a multi-phase power supply."). Thus, current equalization among all phases is important. *Id.*, 1:23-25. While current sense circuits are used, "resister elements" which measure the source current for each phase of the power supply have a "high degree of variation from one to another over changing environmental conditions and over "production lot variations." *Id.*, 1:25-32. Using these elements to sense current "causes a mismatch in the current between phases" and as of the time the '944 Patent issued, there were "no reasonable solutions to this mismatch." *Id.*, 1:34-35.

Additionally, "droop function accuracy is directly related to the current sensing accuracy." *Id.*, 1:43-44. "Historically, setting the droop accurately has also been a major problem due to inadequacies in current sensing and processor batch variations." *Id.*, 1:53-55. With fixed droop settings, which the patent indicates was the norm at the time, "the power supply is unable to adapt to the processor[']s power needs." *Id.*, 1:61-62. This leads to "inefficient and costly" "processor waste" because "processors with power specifications beyond what the power supply can produce are wasted." *Id.*, 1:62-65. Thus, accurate current sensing affects the accuracy of the droop function and inaccurate and fixed droop function leads to waste. Accurate current sensing and droop function also depend on responsiveness to changes in temperature. Because most "elements used in current sensing have positive temperature coefficients," the "resistence of the circuit increases as the temperature increases." *Id.*,1:67-2:2. "This variation results in erroneous

measurements of the current over temperature variations causing further droop inaccuracies." *Id.*, 2:2-4.

As explained in the "Background of the Invention," the global problem the invention was designed to address was "mismatched power phases" in a multiphase regulator with specific problems of excessive heat (caused by unequal current among phases) and processor waste (caused by fixed and inaccurate droop function) both of which were adversely affected by variations in temperature. *Id.*, 1:15-2:7. Given that inaccurate droop function was an identified problem the invention was designed to address, Defendant's proposed construction of "droop outputs" more closely aligns with this purpose. Plaintiffs' proposed construction offers little over what existed in the technology at the time of the invention because a construction in which droop outputs generally adjust voltage does not resolve the problem created by inaccurate or fixed droop function.

The abstract of the invention further supports my conclusion. The abstract expressly states that the invention disclosed is a "circuit for regulating power." *Id.*, Abstract at 1. The invention provides "circuits and methods" for addressing the problems of "current sensing variations, static droop settings, mismatched power phase outputs, and temperature variations" in multiphase power regulators. *Id.* The "circuits" may include a "calibration controller that senses and regulates both a current sensing circuit and the droop in a power regulator over a range of temperatures thus equalizing phase outputs." *Id.* The invention "includes the schematic organization and implementation of the circuit, the circuit's calibration, its use, and implementation." *Id.* According to the abstract, the invention is a single circuit which regulates power but which contains circuits, and methods for addressing the identified problems with

current, droop, power, *and* temperature. *Id.* ("The present invention provides circuits and methods for current sensing variations, static droop settings, mismatched phase outputs, and temperature variations in a multiphase power regulator."). These circuits "may" include a calibration controller. That calibration controller is the only identified component which allows for both "a current sensing circuit and the droop [function] over a range of temperatures [in order to] equalize phase outputs." As depicted in Figure 1, the "circuits" (other than the CCC) that the invention uses to solve the identified problems include the error circuit and the current sense circuit. By its plain language, the abstract discloses that the calibration controller regulates droop function.

When Claim 1 is read in close context with the abstract, the initial "circuit" referred to in Claim 1's introductory paragraph ("What is claimed is: **1**. A circuit . . . ." '944 Patent, 10:1-2) aligns with the comprehensive circuit the abstract states is a "circuit for regulating power." In Claim 1, this comprehensive circuit includes a regulator circuit and a CCC. *Id.*, 10:2-3. This disclosure corresponds to the abstract's reference to the invention providing "circuits." The abstract then states that these "circuits" may include a calibration controller. Claim 1 addresses the components and function of the CCC, the circuit including the calibration controller noted in the abstract.

The abstract indicates that it is the calibration controller, and no other circuit or component, that controls the comprehensive circuit's ability to "sense[] and regulate[] both a current sensing circuit and the droop in a power regulator over a range of temperatures" to equalize power among multiple phase outputs. *Id.* Claim 1, then, must be understood in the context of this description of the CCC. Accordingly, Claim 1 discloses the part of the global

circuit that controls the very functions the invention uses to overcome the identified problems. The CCC's purpose, consistent with the abstract and the background descriptions, is to address the current and droop issues which combined to impair the effective operation of then-existing multiphase power regulators. The CCC's "droop outputs" must bear a relationship to droop function.

Two more arguments need to be addressed. First, reminiscent of its plain language argument, Plaintiffs note that Claims 26-36 expressly recite the circuitry shown in Figure 1 including the error circuit, droop amplifier, and current sense circuit. *Id.*, 11:27-12:44. Plaintiffs contend that Defendant is improperly attempting to import the limitations of Claim 26 into Claim 1. Because the error circuit and other circuitry that actually implement the droop function are shown only in these other claims which are not at issue in the litigation, Plaintiffs argue that Claim 1 should not be construed to require that circuitry.

This is essentially a claim differentiation argument. Claim differentiation principles caution against constructions that result in a dependent claim having the same scope as the independent claim. *Curtiss-Wright Flow Control Corp. v. Velan, Inc.*, 438 F.3d 1374, 1380 (Fed. Cir. 2006). The doctrine "creates a presumption that each claim in a patent has a different scope[.]" *Seachange Int'l, Inc. v. C-COR, Inc.*, 413 F.3d 1361, 1362 (Fed. Cir. 2005) (internal quotation marks omitted) (further explaining that claim differentiation "is not a hard and fast rule of construction" and that it cannot "broaden claims beyond their correct scope, determined in light of the specification and prosecution history and any relevant extrinsic evidence[.]") (internal quotation marks omitted).

As explained above, Claim 1 recites that the CCC interfaces with the regulator circuit via

the droop outputs and uses temperature data to adjust the droop outputs. But, Claim 1 does not recite what the function of that adjustment actually is. That function can be understood only by examining the other parts of the patent. The proper construction of "droop outputs" is discerned only in this context. The fact that additional circuits and components are actually disclosed in other claims does not mean that they cannot provide meaning to the terms in Claim 1. Such examination of the other claims is not equivalent to importing the limitations of those claims into Claim 1. Furthermore, Claim 26 makes no reference to droop outputs and thus, it adds no requirement related to droop outputs. *Id.*, 11:27-12:6. And, as to Claim 29 which Plaintiffs raised for the first time at oral argument, it expressly discloses a multiphase regulator which is not claimed in Claim 1. *Id.*, 12:13-21. And, unlike Claim 1, Claim 29 recites that this regulator have an interface with the CCC. The focus of the claim is the multiphase regulator. Claim 29 is sufficiently distinct from Claim 1.

Second, Plaintiffs contend that Defendant, inconsistent with claim construction standards, improperly relies on only one particular embodiment. They note that Figure 1 depicts only a single embodiment which the patent itself states is a "schematic of one embodiment of the present invention showing two phases of a multiphase regulator connected with a calibration control circuit **190**." *Id.*, 8:34-37. They contend that Claim 1 should not be so limited. *Phillips*, 415 F.3d at 1323 ("although the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments").

The problem with this argument is that the invention disclosed in Figure 1 is the only way the patent appears to achieve its purpose as I have described it above. To give the language in Claim 1 meaning, the circuitry adjusted by the droop outputs has to achieve something distinct

over what occurs in a more typical voltage regulator. If droop outputs do not relate to droop function, they have no distinct function and are meaningless. In short, one essential purported novelty of the invention is the ability to adjust the droop function within a voltage regulator as temperature changes. Figure 1 shows how the invention achieves that purpose.

Moreover, I read the patent specification differently than Plaintiffs regarding what is depicted in Figure 1. The embodiment shown in Figure 1 and described in the patent at 8:34-9:22, is the use of the invention "showing two phases of a multiphase regulator connected with a calibration control circuit." '944 Patent, 8:34-37. That is, Figure 1 and the relevant description show the invention with a multiphase regulator with *two phases*. Defendant's proposed construction of "droop outputs," and my adoption of it, does not improperly limit the terms of Claim 1 to this embodiment because nothing about that construction limits the application of Claim 1 to a regulator with only two phases.

In summary as to "droop outputs," the patent does not recite language showing that "droop outputs" have a general voltage regulating function. The only meaningful understanding of the term is in connection with circuitry showing droop function. Thus, even though Claim 1 does not recite droop function, its use of "droop outputs" necessarily relates to droop function. Any other reading of the claim defeats a novel purpose of the invention.

II. "Sense Outputs"

The second disputed claim term is "sense outputs" as recited in Claim 1's introductory paragraph and again in Elements 2 and 5. Plaintiffs' proposed construction is "outputs of the calibration control circuit used to adjust *the current feedback loop*." Defendant's proposed construction is "outputs of the calibration control circuit used to adjust *the circuitry that*

measures current." The italicized portions are disputed. The gist of the dispute is that Plaintiffs' proposal does not limit "sense outputs" to adjusting the circuitry that measures current. Instead, Plaintiffs' proposal includes adjusting any circuitry in the current feedback loop. Defendant's proposal limits the adjustment made by the sense outputs to the sense amplifier and the current sense circuit which Defendant contends are the only portions of the current feedback loop that are involved in sensing or measuring current. For the reasons explained here, I construe "sense outputs" to mean "outputs of the calibration control circuit used to adjust the measured current signal from the current sense circuit."

Claim 1's references to "sense outputs" align with its references to "droop outputs." After Claim 1's introductory paragraph which discloses that sense outputs are components of the CCC, Element 2 discloses that the CCC interfaces with the regulator circuit via the sense outputs. '944 Patent, 10:8-10. Then in Element 5, Claim 1 provides that the CCC uses temperature data to adjust the sense outputs. *Id.*, 10:15-17. Thus, as with droop outputs, Claim 1's plain language recites (1) a circuit that includes a CCC which has sense outputs as one of several components; (2) the CCC uses temperature data to adjust the sense outputs; and (3) the CCC then uses the sense outputs to interface with the regulator circuit.

Defendant argues that Plaintiffs' proposed construction is contrary to the term "sense outputs" because Plaintiffs' interpretation includes adjustments made to circuitry that have nothing to do with sensing current. Defendant contends that allowing the term to include adjustments to circuitry which are not part of the actual *sense* circuitry would improperly read "sense" out of "sense outputs." Plaintiffs respond by noting that their proposed construction refers to the "current feedback loop" which measures current and feeds the measured current back

to the voltage regulator. Because, in Plaintiffs' opinion, the current feedback loop may include "any of the current ***sense*** circuit, adjustable ***sense*** amplifier, pulse width modulator, or another circuit component of the current feedback loop," Pls.' Resp. Br. 16, Plaintiffs argue that their construction gives proper weight to the word "sense" in Claim 1.

The plain language of Claim 1 shows that the CCC uses temperature data to adjust the sense outputs which then interface with the regulator circuit. Given the claim's use of "sense" to identify these particular outputs, and given that the parties generally use "sense" as synonymous with "measure," the plain language indicates that sense outputs are related to sensing or measuring. There is also agreement that the sensing or measuring at issue relates to current. Plaintiffs' and Defendant's proposals reveal this agreement by using the word "current" and referring to the "current feedback loop." Accordingly, "sense outputs" should be construed as related to current sensing or current measuring. Because Defendant's proposed construction expressly refers to that function, Defendant's interpretation finds more support in the plain language than Plaintiffs' proposed interpretation. But, the plain language does not actually resolve the dispute which is more fundamentally about the meaning of the phrase "current feedback loop." A current feedback loop which includes components that do not measure current would undermine Plaintiffs' proposed construction. And, if the current sense circuit and sense amplifier components of the current feedback loop do not actually measure or sense current, this would undermine Defendants' proposal.

The patent specification explains that the CCC uses the sense outputs to adjust the sense amplifiers in each phase. *Id.*, 7:21-23 (The CCCs "of the present invention may interface with the multiphase regulator by adjusting the sense amplifiers in each phase via the sense outputs.");

id., 9:25-27 ("The [CCC] controls the adjustments to the . . . sense amplifiers via sense outputs **530**."). The specification also explains that the sense amplifier receives input from the current sense circuit and sends outputs to the PWM. *Id.*, 8:49-51 (The "current sense circuit feeds back to the regulator circuit through the adjustable sense amplifier **150** and a pulse width modulator **160**."); *id.*, 8:59-60 ("The output of the adjustable sense amplifier **150** drives the current sense input of the pulse width modulator[.]"); *see also id.*, 7:13-16 ("The current sense circuit measures the current of the output FETs and feeds back to the register via the adjustable sense amplifier and the pulse width modulator."). The PWM outputs a signal to the control circuitry which adjusts the output power. *E.g.*, *id.*, 8:59-62 (The PWM "generate[s] the proper pulse width signal to the power output FET **130** to regulate the output power."). Thus, "[b]y adjusting the feedback gain of the adjustable sense amplifier **150**, variations in the current sense circuit of each phase can be balanced to equalize the load seen by each phase of a multi-phase regulator." *Id.*, 8:54-58.

Defendant's expert explains that a "current feedback loop" uses a current sense circuit, a sense amplifier, the PWM, and control circuitry for switches. Vivek Subramanian Decl. ¶¶ 71, 72, ECF 115-4. He explains that a current sense circuit measures the output current signal supplied to the load and then outputs a corresponding measured current signal. *Id.* ¶ 72. The current sense circuit supplies that measured current signal to a sense amplifier. *Id.* The sense amplifier amplifies the value of the measured current signal and supplies it to the PWM. *Id.* The PWM then outputs a control signal to the control circuitry which adjusts the switches to modify the current being supplied to the load. *Id.* In other words, the current sense circuit measures the amount of current that is supplied to the load and sends the signal to the adjustable sense amplifier. The adjustable sense amplifier then amplifies/increases the measured current signal

and outputs it to the PWM which sends a signal to the control circuitry which modifies the regulator's output based on the measured current signal. The specification passages cited in the previous paragraph support Subramanian's explanation of the current feedback loop. It is also supported by the schematic of Figure 1. Plaintiffs do not dispute Subramanian's characterization.

Plaintiffs argue that the CCC, via the sense outputs, adjusts the current feedback loop as a whole. Pls.' Op. Br. 10-11. They observe that a portion of the current feedback loop measures current and that other portions use the current to maintain stable voltage. They note that the embodiment depicted in Figure 1, which includes an adjustable sense amplifier, confirms that the CCC operates this way. Plaintiffs contend that because the current sense circuit is not adjusted directly by the sense outputs, the current sense circuit is separate from the current sense amplifier and thus, the sense outputs adjust the current feedback loop but do not more narrowly adjust only the circuitry that measures current.

Defendant notes that the patent specification states that the sense amplifier controls the variances in the current sensing circuit. '944 Patent, 8:53-54 ("The adjustable sense amplifier controls the variances in the current sensing circuit."). As explained above, the sense outputs adjust the adjustable sense amplifier which amplifies the measured current signal received from the current sense circuit. Thus, Defendant argues, the sense outputs are used to ensure that the current sensing circuitry provides an accurate measured current signal and "sense outputs" must be construed as being outputs which are used to adjust the circuitry that measures current. Defendant contends that Plaintiffs' proposed construction, which allows the sense outputs to adjust the current feedback loop generally, includes the sense outputs making adjustments to the PWM which does not sense or measure current.

I agree with Defendant that the patent does not support Plaintiffs' broad interpretation. Plaintiffs are correct that the use of the sense outputs does result in an adjustment to the current feedback loop. (This occurs because the sense outputs transmit temperature data from the CCC to the adjustable sense amplifier which uses that data to adjust/amplify the measured current signal the amplifier receives from the current sense circuit which then ultimately causes an adjustment to the control circuitry via the PWM). But, Plaintiffs' proposal would allow an invention where the sense outputs do not actually relate to the measured current. By stating generally that the sense outputs adjust the current feedback loop, Plaintiffs' interpretation allows for more general adjustments to voltage and not specifically to the measured current. As noted above, the claim language indicates that the "sense outputs" are related to current sensing or measuring. Construing sense outputs as adjusting any portion of the current feedback loop fails to credit that the sense outputs are directly related to the action of measuring current.

Plaintiffs have a point, however, regarding the distinction between the sense amplifier and the current sense circuit. Based on the specification and Figure 1, I agree with Plaintiffs that the sense amplifier and the current sense circuit are separate components of the current feedback loop. While they combine to provide an accurate measured current signal to the PWM, the patent suggests that it is the current sense circuit which measures or senses the output current signal supplied to the load. The adjustable sense amplifier adjusts or amplifies that signal based on the temperature data communicated to it by the CCC via the sense outputs. The patent does not indicate that the sense amplifier actually *measures* the current. Although the sense amplifier controls for variances by making adjustments to the measured current signal it receives, there is no basis for concluding that the sense amplifier itself measures current. For that reason, I reject

Defendant's proposed interpretation because although it does not expressly recite that the sense amplifier and the current sense circuit are the "circuitry that measures current," the briefing shows that this is the intent of Defendant's proposed construction.

Given my concerns with each of the proposed constructions, the most accurate interpretation of "sense outputs" is "outputs of the calibration control circuit used to adjust the measured current signal from the current sense circuit." This construction confirms that the sense outputs relate to measuring or sensing current but it avoids the overbroad problem created by Plaintiffs' proposal. It also more specifically describes the function of the sense outputs which is to provide information to the sense amplifier to be used to adjust the measured current signal.

III. "Calibration Control Circuit"

The third disputed claim term is "calibration control circuit" as recited in Claim 1's introductory paragraph and in all of the claim elements except Element 1. Plaintiffs contend that the phrase needs no construction because its meaning is clear. Alternatively, they argue the phrase be construed as "circuitry configured to set or adjust calibration data for use in the control of a regulator circuit." Defendant's proposed construction is a "circuit that calibrates current sensing circuitry and a droop function over a range of temperatures."

Plaintiffs argue that the meaning of the term CCC is clear from its description in Claim 1. Plaintiffs state that Claim 1 shows that the CCC "is circuitry that includes a controller, sense outputs, droop outputs, load voltage input and temperature input, and an interface with a non-volatile memory that stores calibration data." Pls.' Op. Br. 16. Plaintiffs are correct that Claim 1 plainly discloses that the CCC contains all of these components. But, this description of the plain meaning by Plaintiffs omits the function of the CCC as Claim 1 further recites. Claim 1

provides that the CCC (1) receives temperature information from the temperature input which it then uses, by interfacing with the regulator circuit, to adjust the sense and the droop outputs; and (2) it calibrates the calibration data based on information it receives from the temperature input and the load voltage input and stores that calibration data in the nonvolatile memory.

Plaintiffs' description of the "plain meaning" does not address what Claim 1 recites that the CCC actually does. And, it is apparent from Plaintiffs' alternative construction that the parties dispute the nature of the calibration performed by the CCC. The gist of the dispute concerns the role of temperature, and specifically, whether the CCC calibrates based on temperature or more generally performs any type of calibration. In such cases, the court must resolve the dispute. *See O2 Micro Int'l v. Beyond Innovation Tech.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (when "the parties present a fundamental dispute regarding the scope of a claim term, it is the court's duty to resolve it."). I agree with Defendant that the plain language of the claim, the specification, and the purpose of the invention show that the CCC's calibrations are based on temperature.

The claim language makes clear that the CCC (1) receives load voltage input by interfacing with the regulator circuit; (2) receives temperature data by interfacing with the temperature input; (3) "calibrates" "calibration data" based on the load voltage and temperature information it has received via the load voltage and temperature inputs; (4) stores the calibration data in nonvolatile memory; and (5) uses the temperature data to adjust the droop and sense outputs. Based on the plain language, the CCC adjusts the sense and droop outputs in response to temperature data and determines the actual adjustment to be made based on the calibration data the CCC has stored in the nonvolatile memory. In other words, when the CCC receives

temperature data and then makes adjustments to the sense and droop outputs in response, those adjustments are made based on the calibration data stored in nonvolatile memory. That calibration data includes temperature data.

Elements 5 and 6 of Claim 1 in particular support Defendant's proposed construction. Element 5 states that "said temperature data is used by said [CCC] to adjust said sense and droop outputs." '944 Patent, 10:15-17. This shows that a central function of the CCC, adjusting the droop and sense outputs, is based on temperature. It expressly recites that the CCC relies on temperature to adjust these outputs. Given my construction of "droop outputs" and "sense outputs" as explained above, this claim element discloses that the CCC relies on temperature to adjust the droop function and the measured current signal coming from the current sense circuit. Element 5 refutes Plaintiffs' alternative construction indicating that the CCC adjusts any circuitry in the regulator circuit.

Element 6 states that "said [CCC] interfaces with said temperature input and said load voltage input to calibrate said calibration data stored in nonvolatile memory." *Id.*, 10:18-20. This makes clear that the CCC uses temperature as a component of calibration data.

Specification provisions are consistent with these claim elements. For example, the patent states that the CCC "first sampl[es] temperature data from temperature input[,]" then "references the memory for stored calibration data that may be associated with the sampled temperature." *Id.*, 8:24-28. Next, the CCC may set the sense and droop outputs according to the calibrated data. *Id.*, 8:28-30. Another passage states that the CCC calibrates "the droop and sense settings over various temperatures for a specific load[.]" *Id.*, 5:32-34. With this function, the CCC allows the "power supply [to] compensate[] for inaccuracies in the circuit." *Id.*, 5:34-

35. These provisions support a construction where the CCC's calibrations, which it uses to adjust the droop and sense outputs, are based on temperature.

Other parts of the patent further support this construction. The abstract recites that the controller "senses and regulates both a current sensing circuit and the droop in a power regulator over a range of temperatures thus equalizing phase outputs." *Id.*, Abstract at 1; *see also id.*, 2:13 (reciting that the controller is part of the CCC). This passage expressly discloses that the CCC makes adjustments to the droop outputs and sense outputs based on temperature.

The background section of the patent, as previously explained above in connection with the "droop outputs" discussion, describes problems with prior art multiphase voltage regulators including mistmatches in the current between phases which were unresolved with then-existing current sense circuits. *See id.*, 1:15-55. In another passage, the background recites that accurate current sensing is affected by temperature. As noted there, current sensing circuits typically increase resistance as temperature increases. *Id.*, 1:66-2:3. This "results in erroneous measurements of the current over temperature variations causing further droop inaccuracies." *Id.*, 1:66-2:4. The invention was designed to solve "this and other shortcomings of current devices, systems, and methods." *Id.*, 2:5-7.

These passages reveal that as identified by the patent itself, the prior art devices could not properly adjust the current sensing circuitry and the droop function over temperature changes. The prior art devices had problems providing accurate power as temperature changed. The description of the prior art also shows that voltage regulator adjustments with current and feedback loops existed at the time of the invention. The purported novelty of this invention is the ability to adjust the current sense circuitry and droop function as the temperature changes.

Similar to the argument Plaintiffs put forth regarding sense outputs, Plaintiffs' proposed alternative construction is not inaccurate. Because the droop outputs and sense outputs adjust circuits within the regulator circuit, Plaintiffs' proposed construction is generally correct. But, Plaintiffs' proposal fails to include that the patent discloses a specific function related to temperature. And, without including that function in the definition of the CCC, Plaintiffs' proposed construction adds nothing to the already-existing current and feedback loops in the prior art. The patent would fail to address a primary problem the invention set out to solve.

The proper construction of "CCC" as supported by the claim language, the patent specification, and the purpose of the invention is: a "circuit that calibrates current sensing circuitry and a droop function over a range of temperatures."

IV. "Load Voltage Input"

The fourth disputed term is "load voltage input" which appears in Claim 1's introductory paragraph and again in Elements 2 and 5. Plaintiffs argue that no construction is needed because the meaning of the term is plain. Alternatively, Plaintiffs argue that the term should be interpreted as an "input to the [CCC] that provides *load voltage data*." Defendant's proposed construction is an "input to the [CCC] that provides *the voltage supplied to the load.*" The italicized portions are disputed.

The introductory paragraph recites that "load voltage input" is one of the CCC's components. '944 Patent, 10:2-6. Element 2 provides that the CCC "interfaces with said regulator circuit via . . . said load voltage input[.]" *Id.*, 10:8-10. In Element 6, the claim states that the CCC "interfaces with said temperature input and said load voltage input to calibrate said calibration data stored in nonvolatile memory." *Id.*, 10:18-20. Thus, based on Claim 1's plain

language, the CCC includes the load voltage input, the CCC "interfaces with" the regulator circuit via that load voltage input, and the CCC "interfaces with" the load voltage input, along with the temperature input, to calibrate the calibration data.

Plaintiffs argue that the meaning of the phrase is clear from its description in Claim 1. But, similar to Plaintiffs' argument about the plain meaning of the CCC, the plain meaning here does not completely inform the jury what the load voltage input actually provides to the CCC. And, when Plaintiffs' proposed alternative construction is considered, it is apparent that the parties dispute whether the load voltage input to the CCC is the more general description of "the voltage supplied to the load", or the more specific "load voltage data." The claim language, the specification, and the figures support Defendant's construction.

First, the claim language aligns with Defendant's construction. In contrast to the claim's reference to temperature "data" being received by the CCC, the claim makes no such reference with regard to "load voltage." *Id.*, 10:2-20. The only "inputs" recited in the claim are the temperature input and the load voltage input. The claim expressly recites that the CCC interfaces with the temperature input to receive "temperature data." *Id.*, 10:13-14. But, the claim contains no parallel reference to the CCC receiving "load voltage data" from the load voltage input. Thus, the claim language suggests that the "load voltage input" is not restricted to load voltage data.

The specification states that the CCC "may monitor the load voltage output of the current sense circuit via the load voltage input." *Id.*, 3:43-45; *see also id.*, 7:25-27 (same). According to Subramanian, the "load voltage output of the current sense circuit" refers to the voltage that is output from the voltage regulator and supplied to the load. Subramanian Decl. ¶¶ 72, 97-100; Supp'l Subramanian Decl. ¶ 23, ECF 146-5; *see also* '944 Patent, 7:12-16 ("These output FETs

drive the load of the circuit. The current sense circuit measures the current of the output FETs[.]"). Plaintiffs do not appear to dispute Subramanian's explanation of "load voltage output of the current sense circuit" as the voltage output from the voltage regulator which is supplied to the load. Then, in further describing the CCC, the patent provides that the invention includes methods of calibrating a CCC and that the "methods of the present invention may then sample the load voltage input at the interface between the regulator and the load[.]" '944 Patent, 7:43-45.

These provisions, along with Subramanian's explanation, describe how the regulator circuit and the CCC transmit and receive load voltage and show that the voltage which is output from the FET to the load via the current sense circuit is the load voltage inputted to the CCC via the load voltage input. These passages support Defendant's construction because there is no mention of "data," only of "load voltage."

Both parties rely heavily on the figures to support their proposed constructions. Plaintiffs argue that Figure 1 depicts voltage from the load going to the CCC and that Figure 2 confirms that the CCC receives input from the load voltage input via an analog to digital converter (ADC). The specification describing Figure 2 explains that the "controller samples voltage input **570** from the regulator circuit in one embodiment via an analog to digital converter with registered output **670**." *Id.*, 9:44-46. Plaintiffs argue that Figure 2, supported by the relevant descriptions, shows that the CCC may indirectly receive a representation of the load voltage, and not necessarily the load voltage itself, through intervening circuitry. By including the ADC and depicting the load voltage being provided to the CCC via that ADC, Plaintiffs argue that the figures show that the load voltage input provides a digital representation of load voltage. They contend that Defendant's proposed construction, under which load voltage input means the

provision of the voltage itself to the CCC, would improperly read out this embodiment.

Defendant argues that Figures 1 and 2 confirm that the load voltage input provides the voltage supplied to the load and does not mandate that it be load voltage data. Figure 1 shows the switches **130** which generate the regulator's output voltage which is supplied to both the load and as the input to the CCC. Figure 1 confirms Subramanian's explanation that the same load voltage is sent to the load and to the CCC so that the CCC accurately tracts the actual voltage sent to the load. *See id.*, Fig. 1; Supp'l Subramanian Decl. ¶ 26.

Figure 2 is the more detailed schematic of the CCC depicted in Figure 1. '944 Patent, 9:23-24. Figure 2 shows the entire CCC, meaning the entire calibration control *circuit*. As depicted in Figure 2, the CCC contains many components, including the controller (**500**), several digital to analog converters (DACs) (**510** (used with the sense outputs), **600** (used with the droop output), **610** (used with a temperature output)), and two ADCs (**670** (used with the load voltage input), **680** (used with the temperature output)). '944 Patent, Fig. 2. "The main component of the [CCC] is the controller **500**." *Id.*, 9:28-29. Figure 2, along with its description, shows the CCC **500** receiving **570** which is the load voltage input. *See id.*, 9:45-47 ("The controller samples load voltage input **570** from the regulator circuit in one embodiment via an analog to digital converter with registered output **670**.").

Assuming the ADC sends the controller a digital representation of the load voltage that the ADC received, the controller receives something other than the load voltage itself. But, Figure 2 shows that the ADC is a component of the CCC. Thus, the CCC receives the load voltage by virtue of the ADC being a component of the CCC. The fact that the ADC is a component of the CCC and converts the load voltage input from analog to digital before the load

voltage is inputted to the controller means that the *circuit* as opposed to the *controller* within the circuit receives the load voltage itself. Thus, Defendant's construction in which the load voltage input is "input to the CCC that provides the voltage supplied to the load" is consistent with the claim language which provides that the *circuit*, not the *controller*, interfaces with the load voltage input. Defendant's construction is consistent with the embodiment depicted in Figures 1 and 2 and described in the specification. It does not read out that embodiment. Instead, Plaintiffs' proposed construction with its limitation to "load voltage data" would read out this embodiment. Plaintiffs' proposed construction improperly limits the meaning of "load voltage input" to an input providing only load voltage data.

Plaintiffs' expert's testimony fails to convince me that Defendant's proposed construction is erroneous. According to Stephen Melvin, a person of ordinary skill in the art (POSA) "would have understood the term 'load voltage input' in accordance with its plain meaning, which is that the input provides load voltage data." Supp'l Melvin Decl. ¶ 28, ECF 115-6. He states that "[t]here are many ways to represent load voltage in a regulator circuit and a POSA would not understand this limitation to require a direct connection between the load voltage and the calibration control circuit." *Id.* Melvin does not explain *why* a POSA would understand the plain meaning as the load voltage input providing load voltage data. The claim, as noted above, does not use the word "data" regarding load voltage input. Thus, the plain meaning does not reveal an understanding of "load voltage data." Additionally, under Defendant's proposed construction, the claim requires only that the "load voltage input provide 'the voltage supplied to the load' - whether in analog or digital form." Def.'s Resp. Br. 18, ECF 152. This is consistent with Melvin's observation that "a POSA would not understand this limitation to require a direct

connection between the load voltage and the [CCC]." Under Defendant's construction, no particular form is required.

Defendant's construction of "load voltage input" is the proper construction. Based on the patent claim language, the specification language, and the drawings, it is clear that "load voltage input" in Claim 1 should be construed as the input to the CCC that provides the voltage supplied to the load.

V. "Temperature Data Is Used By Said Calibration Control Circuit To Adjust Said Sense Outputs And Said Droop Outputs"

The fifth disputed term is Element 5 of Claim 1: "said temperature data is used by said calibration control circuit to adjust said sense outputs and said droop outputs[.]" '944 Patent, 10:15-17. Plaintiffs' proposed construction is "temperature data is a factor in the determination of one or more sense output and droop output settings." Defendant's proposed construction is "the [CCC] uses the temperature data to adjust both the sense outputs and the droop outputs." The gist of the dispute is that under Defendant's proposal, temperature is used to adjust the sense outputs and used to adjust the droop outputs whereas under Plaintiffs' proposal, temperature is used to adjust only the droop outputs and is not required to be used to adjust the sense outputs. I agree with Defendant that the claim phrase means that temperature adjusts both the droop outputs and the sense outputs.

The plain language of the disputed claim phrase supports Defendant's proposed construction. By using the word "and" in reciting that the CCC uses temperature data "to adjust said sense outputs *and* said droop outputs[,]" the claim itself shows that the CCC uses temperature data to adjust the sense outputs *and* uses temperature data to adjust the droop outputs. '944 Patent, 10:15-17 (emphasis added). I agree with Defendant that "and" means

"and." Only Defendant's proposed construction gives meaning to the word. *See*, *e.g.*, *Leseman, LLC v. Stratasys, Inc.*, 730 F. App'x 912, 915 (Fed. Cir. 2018) (noting that the word "and" is conjunctive and concluding that the claim at issue must have both elements).

The patent specification adds further support with numerous uses of the word "and." *E.g.*, '944 Patent, 2:19-21 ("The temperature data may be used by the [CCC] to adjust the sense outputs and the droop outputs"); *id.*, 2:33-36 ("In another embodiment of the present invention the [CCC] adjusts the sense outputs and the droop outputs according to data stored in the nonvolatile memory."); *id.*, 4:31-33 ("Finally the controller sets the sense output and the droop output of the [CCC] according to the calibrated data."); *id.*, 6:31-34 ("The [CCC] of this invention may adjust the sense outputs and the droop outputs according to data stored in the nonvolatile memory."); *id.*, 7:46-49 ("The sense outputs and the droop output then may be adjusted until the input load voltage meets load operation specifications."); *id.*, 8:28-30 ("Finally the controller may set the sense output and the droop output of the [CCC] according to the calibrated data.").

Plaintiffs point to specification provisions which they argue support their construction. They read these provisions as showing that the current sensing function and the droop function operate independently but that the sense and droop outputs are adjusted as pair. For example, they cite to these two provisions: (1) "By adjusting the feedback gain of the adjustable sense amplifier **150**, variations in the current sense circuit of each phase can be balanced to equalize the load seen by each phase of a multi-phase regulator"; (2) "This adjustable droop amplifier **180** may be used to adjust the droop loss across the current sense circuit." *Id.*, 8:54-58, 8:64-66. Plaintiffs contend that these passages show separate functions in most embodiments where the

sense outputs are used to balance phase currents while the droop outputs are used to calibrate the regulator circuit to correct for temperature variations. They also rely on the following passage: "This invention is a new and innovative active current sharing application that can result in near perfect current match across phases of a multiphase regulator. This invention also provides accurate temperature-independent droop settings that can be programmed for specific and changing applications in the field." *Id.*, 5:16-21. Plaintiffs argue that in these embodiments, only the droop outputs vary based on temperature.

Next, they contend that while temperature is used to adjust the droop outputs, the droop and sense outputs are adjusted as a pair. As I understand their position, Plaintiffs argue that the sense outputs are not directly adjusted by temperature but instead, they are adjusted by temperature along with the droop outputs. *See* Pls.' Op. Br. 20, 21 (it "is clear that temperature data is used to set or adjust a combination of sense and droop output settings, adjusted as a pair of outputs"; "temperature data may be used to reference a combination of sense and droop settings that is stored in memory"; "the combination of sense and droop outputs is adjusted using temperature data"); Pls.' Resp. Br. 25 ("sense and droop outputs are determined as one pair of outputs").

Plaintiffs' arguments are unpersuasive. The claim element expressly recites that the CCC uses the temperature data to adjust the sense outputs *and* the droop outputs. The specification repeatedly refers to the temperature adjusting the sense outputs *and* the droop outputs. Even allowing that these outputs direct separate functions, the disclosed embodiments show that each are adjusted based on temperature. *E.g.*, '944 Patent, 9:19-22 ("The data received from the temperature sensor **210** may be used [by the CCC] to adjust the droop amplifier **180** and the

sense amplifiers **150** to regulate the output power over variations in temperature"). Finally, Plaintiffs' argument that the sense and droop outputs are adjusted as pair is defeated by Claim 1's introductory paragraph. There, Claim 1 discloses a regulator circuit and a CCC in which the CCC "includes a controller, an interface with nonvolatile memory, droop outputs, sense outputs, load voltage input, and temperature input[.]" *Id.*, 10:2-6. Notably, droop outputs and sense outputs are listed serially, separated by a comma, indicating that they are independent components and not a pair. If Plaintiffs' construction were correct, the patent would recite these as "droop outputs and sense outputs." Given that Claim 1 does not do so, Defendant's construction is the proper one.

VI. "Calibration Data"

The sixth disputed term is "calibration data" which is in Elements 1, 3, and 6 of Claim 1. Plaintiffs' proposed construction is "data used in determining droop output and sense output settings, based in part on operating a circuit under known conditions." Defendant's proposal is "data that relates the sense and droop outputs with temperature and is used to adjust those outputs as temperature varies." While both proposed constructions include a relationship between calibration data and the droop and sense outputs, Plaintiffs' proposal is broader than Defendant's proposal because it does not require a relationship between calibration data and temperature. Defendant argues that the term is properly construed as data that relates the sense and droop outputs with temperature. For the reasons explained below, the patent supports the following construction: "Data based on temperature and load voltage inputs which the CCC uses to determine the sense and droop output settings in response to temperature data."

Element 1 recites that the "nonvolatile memory stores calibration data[.]" '944 Patent,

10:7. Element 3 recites that the storage of the calibration data in the nonvolatile memory occurs as a result of the CCC interfacing with the nonvolatile memory. *Id.*, 10:11-12. Finally, Element 6 recites that the CCC calibrates the calibration data by interfacing with the temperature input and load voltage input. *Id.*, 10:18-20. Thus, the plain language of the claim recites that the CCC receives information from the temperature input and the load voltage input which it calibrates into calibration data which it then stores in nonvolatile memory. Therefore, as presented in Claim 1, calibration data is derived from the temperature input and load voltage input and stored in nonvolatile memory. The claim does not expressly recite how the CCC uses the calibration data.

Defendant argues that Claim 1 shows that the only calibration that occurs in the CCC relates to temperature. Based on the plain language of Elements 1, 3, and 6, Defendant contends that the CCC calibrates the calibration data based on the temperature input and load voltage input, stores it in the nonvolatile memory, and then uses that data to adjust the sense and droop outputs. With this understanding and the claim's express references to calibrations relating to temperature, Defendant argues that its proposed language is correct and that Plaintiffs' proposed construction which allows the use of calibration data for any calibration, is inconsistent with the claim language.

Defendant is correct that the CCC calibrates the calibration data based on the temperature and load voltage inputs and stores it in the nonvolatile memory. The claim language makes this clear. However, to the extent Defendant suggests that the claim language provides that the only calibration that occurs relates *solely* to temperature, the suggestion is inconsistent with Element 6. Again, the calibration occurring in Element 6 uses both temperature and load voltage.

Additionally, Defendant is incorrect that the plain language of the claim expressly shows *how* the CCC actually uses the calibration data. The claim does not recite this. It expressly recites that the CCC uses temperature data but it does not recite how the CCC uses calibration data.

Plaintiffs argue that based on the plain claim language, Defendant's reading of the claim renders Element 6 superfluous. Plaintiffs contend that if, under Defendant's interpretation, all calibration data must relate the sense outputs and droop outputs with temperature, then Element 6, which provides for calibrating said calibration data by interfacing with the temperature input would be superfluous. I disagree. Element 6 addresses the composition of the calibration data by reciting that the CCC calibrates the calibration data based on what it has received from the temperature input and the load voltage input. Element 6 does not disclose how the CCC uses the calibrated calibration data which is at the heart of the parties' competing proposals.

The specification notes one embodiment where the CCC "interfaces with the temperature input and the load voltage input to calibrate the calibration data which may be stored in nonvolatile memory." *Id.*, 2:21-24. This is what is then claimed in Element 6 of Claim 1. The specification continues, however, and notes that in another embodiment, the CCC "adjusts the sense outputs and the droop outputs according to data stored in the nonvolatile memory." *Id.*, 2:33-35. Here, the patent expressly recites how the CCC uses the data stored in the nonvolatile memory, although it does not expressly state that the data is "calibration data." However, at this point in the patent, the only data that the specification has indicated is stored in nonvolatile memory is calibration data.

The specification further discloses another embodiment where "the nonvolatile memory stores regulator performance parameters and application specific power curve data." *Id.*, 2:37-39.

This passage indicates that the nonvolatile memory may store data other than calibration data. The "nonvolatile memory may be either monolithic or non monolithic." *Id.*, 2:39-40. Continuing in that embodiment, the "data stored in the nonvolatile memory for the droop outputs and the sense outputs may be based on the load voltage input and the temperature input." *Id.*, 2:41-44. Given the description that this data may be based on the load voltage and temperature inputs, this is a reference to calibration data.

Plaintiffs are correct that this description uses the word "may." Plaintiffs argue that the presence of the word "may" means that using temperature data is optional. But the context of the passage makes it apparent that the word "may" relates to what may be stored in the nonvolatile memory, meaning that data related to temperature and to load voltage *may* be stored in nonvolatile memory. The entire paragraph in which this passage appears addresses the nonvolatile memory and what may be stored there. The paragraph does not address the composition of calibration data. Thus, Plaintiffs' argument is not persuasive when the passage is read in light of the entire paragraph.

Several other passages from the specification are relevant. First, the summary of the invention states:

> The present invention also embodies the methods of calibrating a [CCC] connected with a regulator supplying power to a load. This method begins with estimating the anticipated operation specifications of a circuit's load. Output data may then be created based on this estimate and stored in nonvolatile memory. Both the regulator circuit and the [CCC] may be placed in a circuit with a load. *The load voltage input and temperature input of the [CCC] may be sampled.* The sense outputs and the droop output may be adjusted until the input load voltage meets load operation specifications. *The controller then creates data that relates the temperature with the sense outputs and the temperature with the droop output and store[s] the data in nonvolatile memory.* In this embodiment any number of steps may be omitted or performed in any beneficial order. This process is repeated over a range of anticipated operating temperatures, across each phase,

and with various loads.

Id., 3:54-4:4 (emphases added); *see also id.*, 7:36-56 (disclosing same embodiment in almost identical language in the detailed description of the invention).

This passage discloses an embodiment where the nonvolatile memory stores "output" data which has been created based on an estimate of the anticipated load needs of the circuit. By using the word "output" to modify "data," the passage suggests that "output data" is distinct from the "calibration data" that Claim 1 expressly recites as being based on load voltage input and temperature input.

The passage continues to disclose that the CCC samples load voltage and temperature. The CCC creates data that relates the ongoing incoming temperature information with the sense outputs and droop outputs and stores that data in nonvolatile memory. Then the CCC adjusts the sense outputs and the droop outputs such that the input load voltage meets the load operation specifications. While the passage uses the word "data," and not "calibration data" in describing the data that is created to relate with the sense and droop outputs, it seems clear that it means "calibration data." By describing the creation of this data as being performed by the controller, and by the description of the CCC sampling the load voltage input and temperature input, the passage is consistent with what is claimed in Element 6 of Claim 1 which addresses calibration data. Thus, in this embodiment, calibration data is based on load voltage input and temperature input and is used by the CCC to adjust the sense and droop outputs in response to ongoing temperature data inputted to the CCC. The passage, and the almost identical one found later in the patent at column 7, lines 34-59, indicates that the "methods of the present invention" use the calibration data which has been calibrated based on load voltage and temperature input, to adjust

the droop and sense outputs based on the temperature input. This supports a construction in which calibrated data is used to determine the sense and droop settings in response to ongoing temperature data.

Second, the summary of the invention also provides:

> In another embodiment of the present invention a [CCC] may be implemented in a circuit with a regulator by first sampling temperature data from temperature input. The controller then references the memory for stored calibration data that may be associated with the sampled temperature. Finally the controller sets the sense outputs and the droop outputs of the [CCC] according to the calibrated data.

Id., 4:26-33. As with the previous passage, this passage confirms that the CCC uses the calibrated data to set the sense and droop outputs based on incoming data from the temperature input. This is consistent with the purpose of the invention which is to regulate the sense and droop outputs over a range of temperatures.

Next, in a passage contained in the detailed description of the invention, the specification recites that in the invention, "the power supply compensates for inaccuracies in the circuit" "[b]y calibrating the droop and sense settings over various temperatures for a specific load[.] [T]his *calibration data* may be stored in nonvolatile memory." *Id.*, 5:32-36 (emphasis added). This passage again confirms that the calibration data is used to adjust droop and sense settings in response to incoming temperature data.

Plaintiffs argue that various passages in the specification support their proposed construction that calibration data is "data used to determine droop and sense output settings based in part on operating a circuit under known conditions." First, they point to a portion of the abstract which states that the "present invention provides circuits and methods for current sensing variations, static droop settings, mismatched phase outputs, and temperature variations in a

multiphase power regulator." *Id.*, Abstract at 1. Plaintiffs contend that this passage reveals that calibration data may be used for many reasons, including calibrating a regulator circuit for all of the above. Aside from the obvious lack of reference to "calibration data," this passage is a general statement that recites the problems apparent in then-existing voltage regulator technology that the '944 Patent itself purports to address and overcome. It does not support an interpretation of "calibration data" as being used for many functions in the regulator circuit.

Next, Plaintiffs rely on passages in the detailed description of the invention to show that the invention generates calibration data based on known operating conditions such as a known load, a known temperature, and anticipated operation specifications. *See* Pls.' Op. Br. 12 (relying on '944 Patent, 5:54-6:9, 7:36-59). Plaintiffs acknowledge that one known operating condition may be temperature. But, they contend that a known temperature is not required to generate calibration data. For example, they state, the patent includes embodiments where temperature data is not used in generating calibration data. *Id.* at 12-13. In support, they rely on the following passage:

> This invention includes methods of calibrating a calibration control circuit connected with a regulator supplying power to a load. These methods may begin with estimating the anticipated operation specifications of circuit's load, creating a set of output data based on this estimate, and taking the output data and storing it in nonvolatile memory. Both the regulator and the calibration control circuit may be placed in a circuit with a load.

'944 Patent, 7:36-43. Plaintiffs contend that this passage shows that calibration data is not temperature dependent because the calibration data is first created as a set of estimated output data that is stored for later modification or refinement by the CCC. Pls.' Op. Br. 14-15.

Defendant notes that immediately following this passage, the specification goes on to recite that the "methods of the present invention may then sample the load voltage input at the

interface between the regulator and the load and sample the temperature input of the [CCC]. "

'944 Patent, 7:43-46. Continuing, the passage states:

> The sense outputs and the droop output then may be adjusted until the input load voltage meets load operations specifications. The controller then may create data that relates the temperature with the sense outputs and temperature with the droop output and store the data in nonvolatile memory.

Id., 7:46-51.

These specification passages are nearly identical to the one discussed previously and found at column 3, lines 54 to 67. I disagree with Plaintiffs that the reference to "output data" is a reference to the calibration data claimed in Claim 1. While the passage shows that the invention envisions the creation of data based on the anticipated operations of the circuit's load, the specification passage refers to this as "output data," and not as "calibration data." Moreover, the claim language itself makes clear that the CCC calibrates the calibration data based on data it receives from the load voltage and temperature inputs. The specification sections here do not recite that the CCC creates this "output data."

Instead, when the entire passage is read, it recites the following functions: (1) nonvolatile memory stores "output" data which has been created based on an estimate of the anticipated load needs of the circuit; (2) the CCC samples load voltage and temperature; (3) the CCC creates data that relates the ongoing incoming temperature information with the sense outputs and droop outputs and stores that data in nonvolatile memory; and (4) the CCC adjusts the sense outputs and the droop outputs such that the input load voltage meets the load operation specifications. The passage does not support Plaintiffs' proposed construction of calibration data being based on "operating a circuit under known conditions." The relevant portions of the specification support a construction under which calibration data is data based on temperature

and load voltage inputs and is used to determine the proper sense and droop output settings in response to temperature data.

Plaintiffs also make two claim differentiation arguments. Plaintiffs first refer to Claims 47, 49, and 64 in the original patent application. They argue that because those claims referred to data that relates temperature input with sense and droop outputs, the term "calibration data" in the issued claims must not require temperature. Pls.' Op. Br. 14. Plaintiffs' argument is that because these originally issued dependent claims expressly provided for relating temperature data to sense and droop outputs, then Claim 1, to be distinguished from these dependent claims, cannot be read to require that temperature data be related to the sense and droop outputs.

Defendant responds that because these claims never issued, they should not form the basis for a claim differentiation argument. *E.g.*, *Carnegie Mellon Univ. v. Hoffman-La Roche, Inc.*, No. C-95-3524 SI, 1997 WL 33152823, at *7 (N.D. Cal. Mar. 31, 1997) (court declined to apply the doctrine of claim differentiation to the patentees' filed as opposed to issued claims. The court observed that "the plaintiffs provide no support for the contention that courts must differentiate between filed as opposed to issued claims. The doctrine of claim differentiation assumes that the PTO would not issue several claims of the same scope."); *Rambus, Inc. v. Infineon Techs., AG*, No. Civ. A. 300-CV-524, 2001 WL 34138091, at *15 n.22 (E.D. Va. Mar. 15, 2001) (court rejected argument that claims of the original application which never issued could "trump the clear descriptions and implications of the written description"). I agree with Defendant. Plaintiffs' argument based on the originally filed but unissued claims lacks a sound legal footing.

Next, Plaintiffs point to issued Claim 9 which claims the "circuit of claim **1** where said

nonvolatile memory stores data for said droop outputs and said sense outputs where said data is based on said load voltage input and said temperature input." '944 Patent, 10:41-44. Plaintiffs argue that because dependent Claim 9 contains the requirement that temperature be used in generating all calibration data, Claim 1 cannot be read to include that information. I disagree. Claim 9 does not require that the CCC use temperature data to make adjustments. As explained above, the claim language does not address the CCC's use of calibration data. But, the specification provisions establish that the CCC uses the calibration data (which the CCC calibrates based on information received via the load voltage and temperature inputs), to determine the droop and output settings in response to temperature data. When the entirety of Claim 1 is considered in light of the specifications provisions, it is clear that this is what Claim 1 discloses. Claim 9 claims that data is based on load voltage input and temperature input and that the CCC stores that data for use with the droop and sense outputs in the nonvolatile memory. But, Claim 9 lacks any recitation that the CCC *uses* that data in response to temperature data. Therefore, because the proper construction of Claim 1 is that the CCC calibrates calibration data based on load voltage and temperature inputs and then uses that data to adjust the droop and sense outputs in response to temperature data, and because Claim 9 addresses only the storage of data used with the sense and droop outputs, Claim 9 is distinguished from Claim 1. Plaintiffs' claim differentiation argument based on issued Claim 9 is not persuasive.

The claim language and the specification provisions support a claim construction of "calibration data" that refers to the role of temperature. This is also consistent with the stated purposes of the invention. Finally, while Defendant's proposed construction is consistent with the appropriate claim construction, Defendant omits any reference to load voltage. Thus, the

more appropriate construction is "data based on temperature and load voltage inputs which the CCC uses to determine the sense and droop output settings in response to temperature data."

VII. "[S]aid [CCC] Interfaces With Said Non-Volatile Memory To Store Calibration Data"

The seventh disputed term is the claim phrase "said [CCC] interfaces with said non-volatile memory to store calibration data" which is Element 3 of Claim 1. Plaintiffs contend that the meaning of the phrase is plain. Alternatively, they propose the following construction: "The [CCC] communicates with nonvolatile memory to store calibration data in any memory." Defendant's proposal is "the [CCC] writes calibration data into the nonvolatile memory." The gist of the dispute is whether calibration data may be stored in a memory other than nonvolatile memory. Pls.' Op. Br. 23 (the dispute "turns on where the calibration control circuit must store calibration data.").

Claim 1's introductory paragraph discloses a CCC which includes "an interface with nonvolatile memory" as one of the CCC's components. '944 Patent, 10:4. As stated previously, the parties agree that "nonvolatile memory" means "memory that does not lose data when power to the memory is removed." Element 1 discloses that the "nonvolatile memory" stores calibration data. *Id.*, 10:7. Another reference to nonvolatile memory is in Element 6 which provides that the CCC calibrates the calibration data by interfacing with the load voltage and temperature inputs and stores the calibration in nonvolatile memory. *Id.*, 10:18-20. The disputed phrase in Element 3 is that the CCC "interfaces with said non-volatile memory to store calibration data[.]" *Id.*, 10:11-12. Based on the claim language, calibration data is stored in nonvolatile memory as provided in Element 1 and as reinforced in Element 6. The CCC achieves this storage function by interfacing with the nonvolatile memory as provided in Element 3.

Plaintiffs argue that based on the plain claim language, the disputed phrase states only that the CCC interfaces with nonvolatile memory and can store calibration data. Thus, Plaintiffs contend, this plain reading of the phrase shows that the "[CCC] has the ability to store calibration data, including storing calibration data read from nonvolatile memory into volatile memory, such as for modifying or updating sense and droop output settings (e.g. as depicted in Fig. 2 of the asserted patent)." Pls.' Op. Br. 23-24. They point to Element 1 as support for their position that calibration data may already be stored in nonvolatile memory to be accessed by the CCC.

Defendant argues that because Claim 1 makes no reference to any type of memory other than nonvolatile memory, Plaintiffs' stated meaning is not plain. I agree that Plaintiffs' understanding of the plain meaning as allowing the CCC to store calibration data in any type of memory is not apparent from the claim language. Thus, given the dispute between the parties' proposals, the claim phrase is subject to construction.

Plaintiffs argue that because the claim requires only that the nonvolatile memory store calibration data, the claim allows the calibration data stored in nonvolatile memory to be read from nonvolatile memory and stored in another memory. Pls.' Resp. Br. 18. They argue that "[a]fter interfacing with nonvolatile memory, the calibration data may be stored in any type of memory." *Id.* As I understand Plaintiffs' argument, they contend that once the CCC interfaces with the nonvolatile memory to store calibration data, the CCC may then read that calibration data and store it in another memory.

Defendant relies on Element 1 which discloses that "said nonvolatile memory stores calibration data," to argue that nonvolatile memory is required to store calibration data. I agree that the nonvolatile memory must be capable of storing the calibration data to satisfy this

element. Thus, to the extent Defendant uses "required" to mean capability, Defendant is correct. Plaintiffs suggest that Element 1 indicates that calibration data may already be stored in nonvolatile memory. Therefore, they argue, Element 3 must refer to the CCC accessing that data from nonvolatile memory and storing it in some other memory. After Element 1 recites that the nonvolatile memory stores calibration data and nothing more, Element 3 then expressly discloses that the CCC interfaces with the nonvolatile memory to store the calibration data. Thus, the claim itself shows that after Element 1 requires that the nonvolatile memory be capable of storing calibration data, Element 3 recites that the CCC interfaces with the nonvolatile memory to store the calibration data there. Defendant is correct that the claim phrase makes no reference to any other type of memory where calibration data is stored. Element 6 then confirms that calibration data is stored in nonvolatile memory.

I further agree with Defendant that Plaintiffs' proposed construction is contrary to the disputed phrase's use of the infinitive verb "to store." As Defendant explains, the verb ties together the two functions disclosed in Elements 3: (1) the CCC interfaces with the nonvolatile memory; and (2) the CCC stores the calibration data. By specifying that the CCC "interfaces with said non-volatile memory *to store* calibration data," the claim recites that the CCC interfaces with the nonvolatile memory *in order to* store the calibration data. Thus, the plain language shows that the CCC does not store data in any memory. It requires that the CCC interface with the nonvolatile memory to achieve a specific function of storing calibration data in that memory and not another memory.

The specification also makes no reference to the CCC interfacing with the nonvolatile memory to store calibration data in some other memory. Instead, numerous specification

passages refer to the CCC storing calibration data in the nonvolatile memory. *E.g.*, '944 Patent, 2:21-24, 6:20-23 ("The [CCC] also interfaces with the temperature input and the load voltage input to calibrate the calibration data which may be stored in nonvolatile memory); *id.*, 3:54-67 (stating, in pertinent part, that the "controller then creates data that relates the temperature with the sense outputs and temperature with the droop outputs and store[s] the data in nonvolatile memory"); *id.*, 7:49-51 ("The controller then may create data that relates the temperature with the sense outputs and temperature with the droop output and store the data in nonvolatile memory").

Plaintiffs point to other specification passages which they argue support their reading of the claim phrase. The summary of the invention contains a passage providing that the "controller then[] references the memory for stored calibration data that may be associated with the sampled temperature. Finally, the controller sets the sense output and the droop output of the [CCC] according to the calibrated data." '944 Patent, 4:29-33. Later, in the detailed description of the invention, Plaintiffs point to this passage: "This calibration data is preferably stored in nonvolatile memory, where it can be reused, modified, and restored throughout the life of the power supply." *Id.*, 5:23-25. Plaintiffs argue that these passages describe an embodiment where the controller reads calibration data that was previously stored in nonvolatile memory and then stores the data in another memory, such as memory within the CCC's state registers, processor registers, and RAM. Pls.' Op. Br. 25-26. In particular as to the first of these two passages, Plaintiffs focus on a specific portion of the passage which states that the controller "references the memory for stored calibration data" to argue that the calibration data stored in nonvolatile memory may be read from nonvolatile memory and stored in another memory.

I disagree with Plaintiffs. The first passage from the summary of the invention shows that

the CCC references the memory for stored calibration data that may be associated with sampled temperature. This passage does not show that after the controller references the memory for that data, it then stores it in another memory. And, the second passage expressly refers to calibration data being stored in nonvolatile memory and not some other type of memory. Additionally, this second passage, by referring to the reuse, modification, and restoration of the calibration data, highlights the importance of the nonvolatile memory and its advantage over other types of memory because, as the parties agree, nonvolatile memory is "memory that does not lose data when power to the memory is removed."

Plaintiffs also point to the second passage's use of the word "preferably" which Plaintiff argues shows that the specification does not mandate that the calibration data be stored in nonvolatile memory. As explained by the Federal Circuit in a 2003 case, the "term 'preferably' makes clear that the language describes a preferred embodiment, not the invention as a whole." *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1357 (Fed. Cir. 2003). Ordinarily, claims are not limited to their preferred embodiments. *CVI/Beta Ventures, Inc. v. Tura LP*, 112 F.3d 1146, 1158 (Fed. Cir. 1997); *see also Amhil Enter., Ltd. v. Wawa, Inc.*, 81 F.3d 1554, 1559 (Fed. Cir. 1996) (holding that "[a] preferred embodiment . . . is just that, and the scope of a patentee's claims is not necessarily or automatically limited to the preferred embodiment"). Nonetheless, the written description is not a substitute for the claim language. *SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 874-75 (Fed. Cir. 2004) ("We review the patent's written description and drawings to confirm that the patentee's use of the disputed term is consistent with the meaning given to it by the court . . . The written description, however, is not a substitute for, nor can it be used to rewrite, the chosen claim language. Specifications teach. Claims claim.")

(internal quotation marks omitted). While this passage found at column 5, lines 23-25, discloses a preference for storing calibration data in nonvolatile memory and does not recite such storage as an express requirement, the plain language, as explained above, establishes that Claim 1 requires storage of the calibration data in the nonvolatile memory. Again, by using the infinitive "to store," Element 3 recites that the CCC interfaces with the nonvolatile memory in order to store the calibration data. No other memory is mentioned in Claim 1.

Plaintiffs also point to the part of the specification describing Figure 2 stating that "the controller **500** [of the CCC] may be a state machine, a processor or any other logic device." '944 Patent, 9:29-30. Plaintiffs note that by disclosing that the controller may be a state machine, processor, etc., this passage discloses circuitry that interfaces with nonvolatile memory to retrieve calibration data and store it for use by the CCC. Pls.' Op. Br. 24. Plaintiffs represent that inherent in a state machine or a processor is volatile memory in the form of state registers, processor registers, and RAM. *Id.* (citing Melvin Decl. ¶ 25, ECF 115-5). They argue that "[r]eading calibration data from nonvolatile memory for use by a processor or state machine inherently involves the calibration data in a volatile memory." *Id.* (citing Melvin Decl. ¶ 25). Further, Plaintiffs contend, the "digital to analog converters include registered inputs . . . which may also be volatile memory for storing calibration data." *Id.* As I understand it, Plaintiffs argue that because the specification discloses components (state machine, processor) that "inherently" include volatile memory, then the reading of calibration data for use by such components inherently involves storing the calibration data in a volatile memory. In the face of the claim language and other parts of the specification, this passage does not convince me that the use of a component which inherently contains volatile memory means that the CCC is not required to

store calibration data in nonvolatile memory. The specification's provision that the controller might be something that has volatile memory does not show that the controller interfaces with nonvolatile memory to then store the calibration data in some other, volatile memory.

Plaintiffs point to another passage describing Figure 2 which recites that the controller "also interfaces with an external controller that may control the adjustments directly, read the status values of the sample inputs for temperature and load voltage, and to read and write the nonvolatile memory contents." '944 Patent, 9:54-58. Plaintiffs argue that this passage shows that the patent discloses embodiments where calibration data is written to nonvolatile memory but in which the CCC interfaces with other circuitry such as an external controller, to write to the nonvolatile memory. Pls.' Op. Br. 26 (additionally citing to '944 Patent, 7:58-59 ("The external controller may create the output data and write it to the nonvolatile memory")). They argue that because this passage discloses the controller interfacing with an external controller to perform these functions, Defendant's proposal "reads out" embodiments covered by the asserted claims. That is, according to Plaintiffs, Defendant's proposed construction which requires the CCC to store calibration data in nonvolatile memory would not allow this embodiment in which an external controller performs that storage function.

The cited passage, as I understand it, describes an embodiment where the CCC can use an external controller to directly control the adjustments, to read the temperature input and load voltage input, and to read and write the nonvolatile memory contents. But, the passage still envisions the CCC storing or writing the data into the nonvolatile memory. The CCC performs this function via an internal controller or an external controller. Either way, the CCC still is required to store the data in nonvolatile memory. Thus, Defendant's proposal does not "read out"

this embodiment because the CCC still interfaces with the nonvolatile memory to store calibration data. It just does it via an external controller instead of an internal one. Additionally, nothing about this passage supports Plaintiffs' proposed construction under which calibration data may be stored in "any memory."

Defendant's proposal uses the word "writes" instead of "stores" to describe how the CCC provides calibration data into the nonvolatile memory. Defendant argues that the disclosed function of "interfacing with the nonvolatile memory to store calibration data" refers to writing data to nonvolatile memory. According to Defendant's expert, electrical engineers use the words "read" or "write" to discuss the retrieval and storage of data in memory, and thus, the claim language of "store" is understood to mean "write." Subramanian Decl. ¶ 150; *see also* Hirsch Decl., Ex. 8 at 5 (IBM Dictionary of Computing (1994) providing the definition of "write" as "[t]o make a permanent or transient recording of data in a storage device or on a data medium."), ECF 146-8. By stating that the CCC stores calibration data in nonvolatile memory, the claim recites that the CCC writes calibration data to the nonvolatile memory.

Plaintiffs do not dispute that "store" means "write." But, they argue that Defendant's interpretation goes against claim differentiation principles by rendering dependent Claim 19 indistinguishable from Claim 1. Claim 19 depends from Claim 18 which in turn depends from Claim 1. Claim 18 provides: "The circuit of claim **1** where said calibration control circuit includes an external interface to an external controller." '944 Patent, 11:3-5. Then, Claim 19 adds:

> The circuit of claim **18** where said external interface to an external controller allows said external controller to interface with said calibration control circuit, monitor said load voltage input, monitor said temperature input, control sense outputs, droop output, read said nonvolatile memory, and write to nonvolatile

memory.

Id., 11:6-11.

Plaintiffs argue that the language in Claim 19 adds the particular limitation of writing to nonvolatile memory. Because it is recited here, Claim 1 should not be construed to include this limitation. But, Claim 19 provides for a component not claimed in Claim 1 - an external controller which can, among other functions, "write to nonvolatile memory." Because Claim 19 adds an additional limitation to Claim 1 with the inclusion of an external controller, it is narrower than Claim 1 and there is no claim differentiation issue.

The parties do not dispute that the CCC stores calibration data in nonvolatile memory. This is clear from the claim language. Defendant's proposal that the CCC "writes calibration data into the nonvolatile memory" is consistent with the plain language. The use of the verb "to store" means that the CCC interfaces with the nonvolatile memory *in order* to store the calibration data there. The claim language makes no mention of storing calibration data anywhere other than nonvolatile memory. Plaintiffs' proposal is inconsistent with the claim language because it provides for "communicating" with nonvolatile memory to store the calibration data "in any memory."

The specification references repeatedly refer to the storage of calibration data in nonvolatile memory. Plaintiffs fail to cite to specification passages supportive of their proposal. Contrary to Plaintiffs' assertion, Claim 19 is distinguishable from Claim 1's requirement that the CCC store calibration data in nonvolatile memory because Claim 19 includes an external controller. Based on the claim language and the specification provisions, the proper construction of Element 3 is "the calibration control circuit writes calibration data into the nonvolatile

memory."

VIII. "Said Calibration Control Circuit Interfaces with Said Regulator via Said Sense Outputs, Said Droop Outputs, and said Load Voltage Input"

The final disputed claim is Element 2 of Claim 1: "said [CCC] interfaces with said regulator via said sense outputs, said droop outputs, and said load voltage input." *Id.*, 10:8-10. Plaintiffs' proposed construction is "plain meaning," or alternatively "the [CCC] communicates with the regulator circuit by *way of the sense outputs, droop outputs, and load voltage input.*" Defendant's proposed construction is "the [CCC] communicates with the regulator circuit by *receiving the regulator's output voltage via the load voltage input and by sending adjustments to the regulator via the sense and droop outputs.*" The italicized portions of the proposals highlight the dispute, the gist of which concerns whether an explanation of how the CCC actually interfaces with the regulator is needed.

The claim language is straightforward and understandable. The CCC interfaces with two outputs and one input. The particular outputs and particular input are specified. Because "interfaces" is plainly understood as interacting with or communicating with, there is no need to substitute "communicates" for "interfaces with." Additionally, because "via" is a commonly used word in English whose meaning is clearly understood as "by way of," there is no need to substitute "via" with "by way of." Additionally, "output" is readily understood as sending something and "input" is readily understood as receiving something.

Defendant's proposed construction unnecessarily adds to the claim by delineating what is actually sent and received in the communication between the CCC and the regulator circuit. Because the previous constructions outlined here already establish that "load voltage input" is load voltage and that "droop outputs" and "sense outputs" are outputs which adjust the droop

function and measured current signal, there is no need to further construe Element 2 to include the functions of receiving load voltage or adjusting the sense and droop outputs. Therefore, in the context of the other claim constructions, the plain meaning of Element 2 is clear and the claim phrase needs no construction.

CONCLUSION

The eight disputed claim terms/phrases are construed as follows:

1. "Droop Outputs": "Outputs of the calibration control circuit used to adjust the droop function (*i.e.* the function that automatically lowers the output voltage based on the output current)."

2. "Sense Outputs": "Outputs of the calibration control circuit used to adjust the measured current signal from the current sense circuit."

3. "Calibration Control Circuit": "A circuit that calibrates current sensing circuitry and a droop function over a range of temperatures."

4. "Load Voltage Input": " Input to the [CCC] that provides the voltage supplied to the load.."

5. "Temperature Data is Used by Said Calibration Control Circuit to Adjust Said Sense Outputs and Said Droop Outputs": "The calibration control circuit uses the temperature data to adjust both the sense outputs and the droop outputs."

6. "Calibration Data": "Data based on temperature and load voltage inputs which the CCC uses to determine the sense and droop output settings in response to temperature data."

7. "Said Calibration Control Circuit Interfaces with Said Nonvolatile Memory to Store Calibration Data": "The calibration control circuit writes calibration data into the nonvolatile

memory."

8. "Said Calibration Control Circuit Interfaces with Said Regulator Circuit Via Said Sense Outputs, Said Droop Outputs, and Load Voltage Input": no construction.

IT IS SO ORDERED.

Dated this 10 day of September, 2019

Marco Hernandez

Marco A. Hernandez
United States District Judge